



READING CONTRIBUTORY RETIREMENT SYSTEM

ACTUARIAL VALUATION (REVISED)

as of

January 1, 2019

Prepared by:

KMS Actuarial, LLC
52 Hunt Road
Kingston, NH 03848

June, 2020



June 4, 2020

Reading Contributory Retirement Board
16 Lowell Street
Reading, MA 01867

Dear Board Members:

We are pleased to present the enclosed report providing the revised results of our actuarial valuation of the Reading Contributory Retirement System as of January 1, 2019, updated from the report released in December, 2019 to reflect the Retirement Board's adoption of a revised funding schedule on May 7, 2020. Our valuation was performed in accordance with the provisions contained in Chapter 32 of the Massachusetts General Laws, "M.G.L.", as of January 1, 2019. Disclosures under GASB Statement No. 67, Financial Reporting for Pension Plans (GASB 67) and GASB Statement No. 68, Accounting and Financial Reporting for Pensions (GASB 68) are provided in a separate report.

The principal results of our valuation are summarized in Section 2. The Summary of Plan Provisions and Actuarial Methods and Assumptions are shown in Sections 5 and 6, respectively. Section 7 summarizes the demographic profile of active members, retired plan members and beneficiaries and disabled plan members. Asset information and actuarial liabilities are presented in Section 2. The development of the required appropriations pursuant to Chapter 32 of the M.G.L. is shown in Section 3, including a 30-year forecast of the required appropriations and projected cash flows. The summary of information for PERAC is presented in Section 4.

This valuation is based upon member data provided by the Reading Contributory Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Retirement Board. Although we did not audit the data used in the valuation, we believe that the information is complete and reliable.

Liabilities presented in this report are based on a long-term investment return rate assumption of 7.5%, net of investment expense, compounded annually.

This report was completed in accordance with generally accepted actuarial standards and procedures, and conforms to the Code of Professional Conduct of the American Academy of Actuaries. The actuarial assumptions used in the determination of costs are reasonably related to the experience of the System and to reasonable expectations, and represent our best estimate of anticipated long-term experience under the System.

K M S A C T U A R I E S

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Future actuarial valuation results may differ significantly from the current results presented in this report. Examples of potential sources of volatility include plan experience differing from that anticipated by the economic or demographic assumptions, the effect of new entrants, changes in economic or demographic assumptions, the effect of law changes and the delayed effect of smoothing techniques.

Our valuation follows generally accepted actuarial methods and we perform such tests as we consider necessary to assure the accuracy of the results. The amounts presented in this report have been appropriately determined according to the actuarial assumptions and methods stated herein.

This report is intended for the sole use of the Reading Contributory Retirement System and is intended to provide information to comply with the stated purpose of the report. It may not be appropriate for other purposes.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinion contained herein. They are available to answer any questions with regard to this report.

Respectfully submitted,



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SECTION 1 - SUMMARY

Background

We have completed the Actuarial Valuation of the Reading Contributory Retirement System as of January 1, 2019. This valuation is based upon census data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Reading Contributory Retirement Board. Information for the prior valuation completed as of January 1, 2017 was obtained from the valuation report prepared by KMS Actuaries, LLC.

Massachusetts General Laws

The valuation was prepared in accordance with Chapter 32 of the Massachusetts General Laws ("M.G.L."). The results are based on the active, inactive and retired members and beneficiaries as of January 1, 2019, the assets as of December 31, 2018 and assumptions regarding investment returns, salary increases, death, turnover, disability and retirement.

The valuation does not take into consideration:

- Changes in the law after the valuation date,
- Transfers between retirement systems pursuant to Section 3(8)(c) of Chapter 32,
- State-mandated benefits and
- Cost-of-living increases granted to members in pay status between 1982 and 1997.

GASB Statement Numbers 67 and 68

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, Financial Reporting for Pension Plans, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, Accounting and Financial Reporting for Pensions, replaced the requirements of Statement No. 27.

The new pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the new standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

The required disclosures and notes under the new GASB Statements for the fiscal year ending December 31, 2018 are provided in a separate report.

SECTION 1 - SUMMARY

Actuarial Valuation

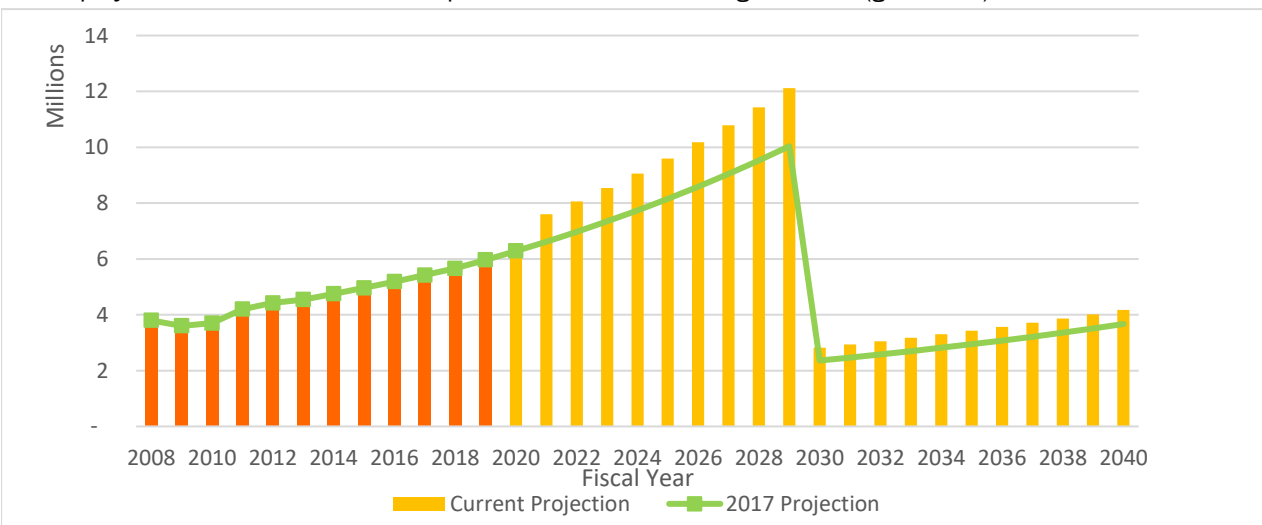
During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease from \$45,379,316 as of January 1, 2017 to \$40,759,742 as of January 1, 2019, for a total decrease of \$4,619,574. The actual unfunded actuarial accrued liability, before any assumption or plan changes, was \$45,223,571, resulting in an actuarial loss of \$4,463,829. The details of the gain and loss analysis are provided in Exhibit 2.6.

Appropriations

The funding appropriation for each year is computed as the sum of the normal cost and an amortization payment to pay off the Unfunded Actuarial Liability, adjusted for semi-annual payments of the appropriation made August 1 and December 31. The appropriation calculated as of the January 1, 2019 valuation is \$7,167,435, and is made up of a normal cost payment of \$1,804,558 and an amortization payment of \$5,362,877. The amortization method is an increasing amortization of the unfunded actuarial accrued liability at 4.5% over 10 years and is expected to fully pay the unfunded actuarial accrued liability by the year 2029. The development of the appropriation as of January 1, 2019 is presented in Exhibit 3.1.

For fiscal year 2020, we show the actual appropriation developed under the previous funding schedule and reported on the PERAC "Required Fiscal Year 2020 Appropriation" letter dated November 13, 2018 of \$6,282,942. For fiscal year 2021, we developed an annual appropriation of \$7,603,181, which is made up of a normal cost of \$1,981,023 and payment toward the unfunded actuarial accrued liability of \$5,622,158. The unfunded actuarial accrued liability is expected to be fully paid by 2029. The Board adopted a schedule that limits the annual increase in appropriation to 6% for each year, except fiscal 2021, which is further reduced by \$283,437. The current funding schedule is shown in Exhibit 3.2.

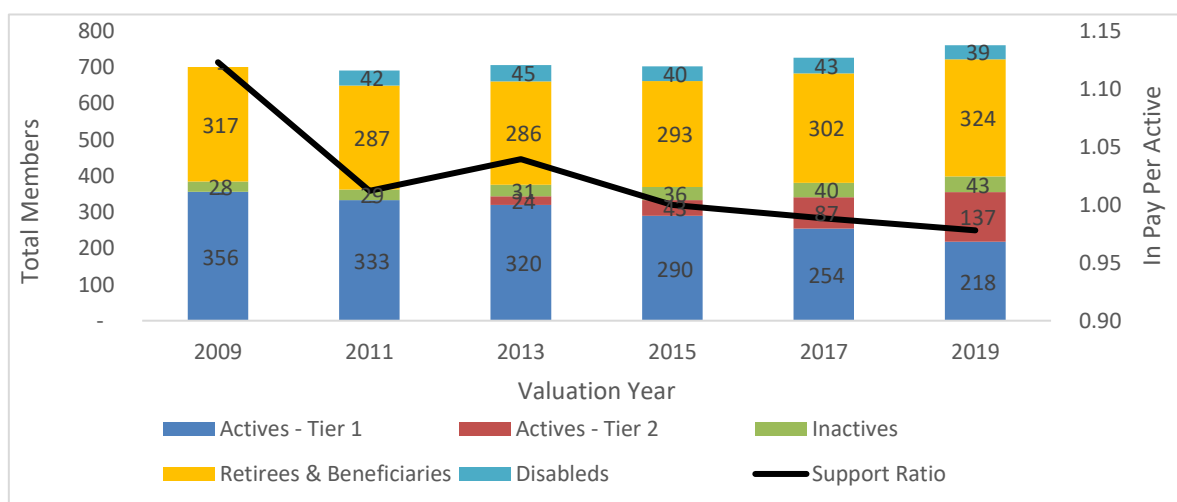
The chart below shows the historical (orange bars) and projected (yellow bars) annual appropriations compared to the projected amounts shown in the prior valuation and funding schedule (green line).



SECTION 1 - SUMMARY

A summary of principal valuation results from the current valuation and the prior valuation follows. Changes in actuarial assumptions and methods and Plan provisions are discussed below, as well as changes in census data and asset information.

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>	<u>Increase/ (Decrease)</u>
Summary of Member Data			
Active Members	355	341	4.1%
Average Age	47.0	48.3	(2.7%)
Average Service	12.8	14.1	(9.5%)
Valuation Salary	\$27,381,485	\$24,883,071	10.0%
Average Salary	\$77,131	\$72,971	5.7%
Retired Members and Beneficiaries	324	302	7.3%
Average Age	74.5	74.9	(0.5%)
Total Annual Retirement Allowance	\$10,263,921	\$8,884,683	15.5%
Average Annual Retirement Allowance	\$31,679	\$29,419	7.7%
State Reimbursed COLAs	\$61,120	\$68,170	(10.3%)
Total System-Funded Retirement Allowance	\$10,202,801	\$8,816,513	15.7%
Disabled Members	39	43	(9.3%)
Average Age	67.2	67.8	(0.8%)
Total Annual Retirement Allowance	\$1,421,542	\$1,461,098	(2.7%)
Average Annual Retirement Allowance	\$36,450	\$33,979	7.3%
State Reimbursed COLAs	\$37,110	\$45,630	(18.7%)
Total System-Funded Retirement Allowance	\$1,384,432	\$1,415,468	(2.2%)
Inactive Members	43	40	7.5%
Annuity Savings Fund	\$1,285,478	\$1,117,296	15.1%



SECTION 1 - SUMMARY

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>	<u>Increase/ (Decrease)</u>
Funded Status - Market Value of Assets			
Actuarial Accrued Liability (AAL)	\$189,428,337	\$173,147,741	9.4%
Market Value of Assets (MVA)	\$136,261,047	\$123,992,243	9.9%
Unfunded Accrued Liability	\$53,167,290	\$49,155,498	8.2%
Funded Status	71.9%	71.6%	0.4%
Funded Status - Actuarial Value of Assets			
Actuarial Accrued Liability (AAL)	\$189,428,337	\$173,147,741	9.4%
Actuarial Value of Assets (AVA)	142,056,825	\$127,768,425	11.2%
Unfunded Accrued Liability	\$47,371,512	\$45,379,316	4.4%
Funded Status	75.0%	73.8%	1.6%
Normal Cost			
Total Normal Cost	\$4,321,147	\$3,591,977	20.3%
Employee Normal Cost	2,716,589	2,400,321	13.2%
Administrative Expenses	200,000	175,000	14.3%
Net Employer Normal Cost	\$1,804,558	\$1,366,656	32.0%
Appropriations			
Fiscal Year 2019	N/A	\$5,964,366	N/A
Fiscal Year 2020	\$6,282,942	\$6,282,942	0.0%
Fiscal Year 2021	\$7,603,181	\$6,618,532	14.9%
Fiscal Year 2022	\$8,059,372	\$6,972,047	15.6%

Actuarial Assumptions and Methods

Some Actuarial Assumptions and Methods used in this valuation have changed since the last valuation, including reducing the investment return rate from 7.65% to 7.50%, updating the mortality table to the PERAC standard table and increasing the administrative expense assumption from \$175,000 to \$200,000. Changing these assumptions resulted in a net increase in the unfunded actuarial accrued liability of \$510,160 and an increase in the employer normal cost of \$352,848. The Actuarial Assumptions and Methods utilized in this valuation are detailed in Section 6, Actuarial Assumptions and Methods.

Plan Provisions

All Plan provisions used in this valuation are the same as those used in the prior valuation, except the COLA base was increased from \$12,000 to \$14,000 effective July 1, 2020. Increasing the COLA base resulted in a net increase in the unfunded actuarial accrued liability of \$1,637,781 and an increase in the employer normal cost of \$34,117. The Plan Provisions are summarized in Section 5, Summary of Plan Provisions.

SECTION 1 - SUMMARY

Census Data

As of January 1, 2019, there are 355 active members who may be eligible for benefits in the future, 324 retirees and beneficiaries, 43 inactives and 39 disabled retirees. Summaries of the active, retired and disabled employees are included in Section 7, Demographic Information.

Assets

This valuation is based upon asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Reading Contributory Retirement Board. The market value of assets increased from \$123,992,243 as of December 31, 2016 to \$136,261,047 as of December 31, 2018. During the plan years ended 2017 and 2018, the market value rates of return were 17.60% and -1.39%, respectively.

The actuarial value of assets increased from \$127,768,425 as of January 1, 2017 to \$142,056,825 as of January 1, 2019. During the plan years ended 2017 and 2018, the rates of return on the actuarial value of assets were 8.78% and 6.57%, respectively.

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Reading Contributory Retirement System. The Market Value of Assets for the three most recent calendar years are as follows:

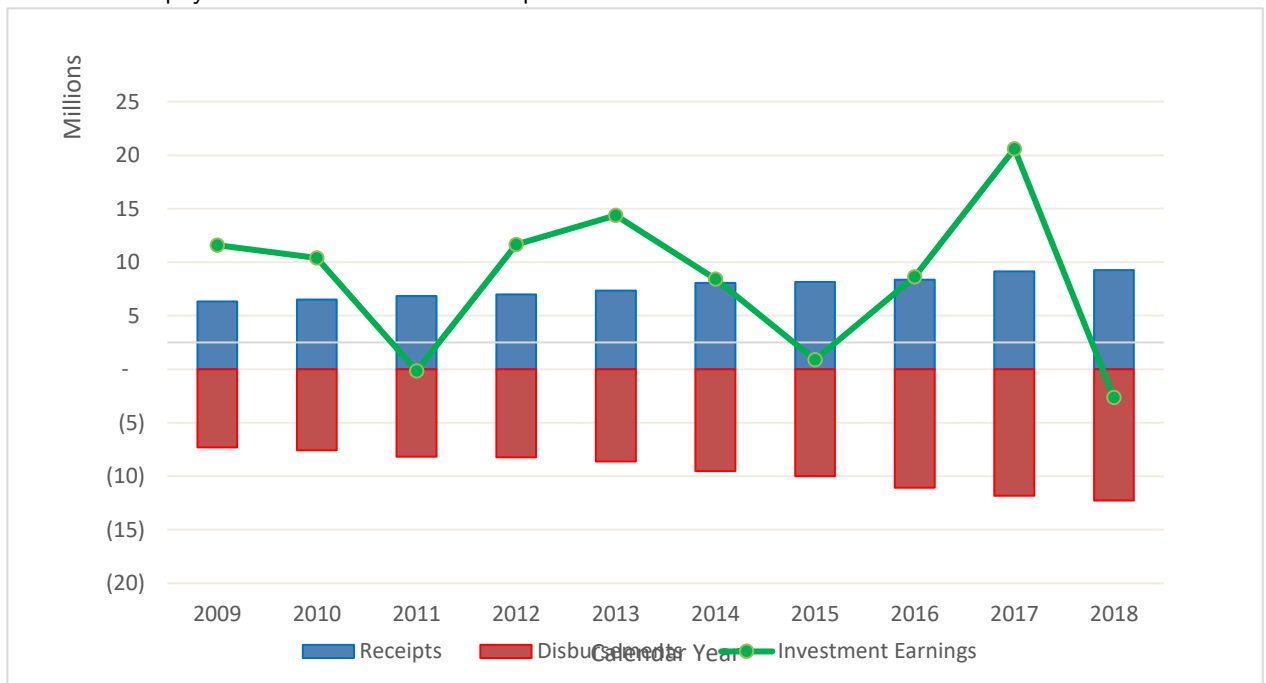
Calendar Year	2018	2017	2016
Trust Fund Composition at Year-End			
Cash	\$13,042,063	\$6,779,499	\$213,826
Short-Term Investments	0	0	0
Fixed Income Securities	0	0	0
Equities	0	0	0
Pooled Short Term Funds	0	0	0
Pooled Domestic Equity Funds	0	0	0
Pooled International Equity Funds	0	0	0
Pooled Global Equity Funds	0	0	0
Pooled Domestic Fixed Income Funds	0	0	0
Pooled International Fixed Income Funds	0	0	0
Pooled Global Fixed Income Funds	0	0	0
Pooled Alternative Investments	0	0	0
Pooled Real Estate Funds	0	0	0
Pooled Domestic Balanced Funds	0	0	0
Pooled International Balanced Funds	0	0	0
Hedge Funds	0	0	0
PRIT Cash	902	572	2,225,415
PRIT Fund	123,159,975	134,972,190	121,496,781
Interest Due & Accrued	0	0	0
Prepaid Expenses	8,400	8,400	8,400
Accounts Receivable	50,292	145,257	47,821
Land	0	0	0
Buildings	0	0	0
Accumulated Depreciation - Buildings	0	0	0
Accounts Payable	(585)	0	0
Total Market Value of Assets	<u>\$136,261,047</u>	<u>\$141,905,918</u>	<u>\$123,992,243</u>

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Calendar Year	2018	2017	2016
Funds			
Annuity Savings Fund	\$26,390,829	\$25,930,417	\$25,386,545
Annuity Reserve Fund	10,370,100	9,753,591	9,057,616
Special Military Service Fund	26,808	26,846	26,819
Pension Fund	9,188,152	9,453,239	9,960,187
Expense Fund	0	0	0
Pension Reserve Fund	90,285,158	96,741,825	79,561,076
Total Market Value of Assets	<u>\$136,261,047</u>	<u>\$141,905,918</u>	<u>\$123,992,243</u>
Asset Activity			
Market value as of Beginning of Year	\$141,905,918	\$123,992,243	\$118,077,797
Contributions and Receipts	9,270,333	9,137,270	8,357,205
Benefit Payments and Expenses	(12,258,490)	(11,816,827)	(11,083,350)
Investment Return	(2,656,714)	20,593,232	8,640,591
Market Value as of End of Year	<u>\$136,261,047</u>	<u>\$141,905,918</u>	<u>\$123,992,243</u>
Rate of Return	-1.39%	17.60%	8.14%

Below are the receipts and disbursements during the last 10 years. The green line reflects investment gains and losses, which vacillate as investment markets fluctuate. Blue bars indicate contributions, from employees and employers, and red bars show benefit payments and administrative expenses.



SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

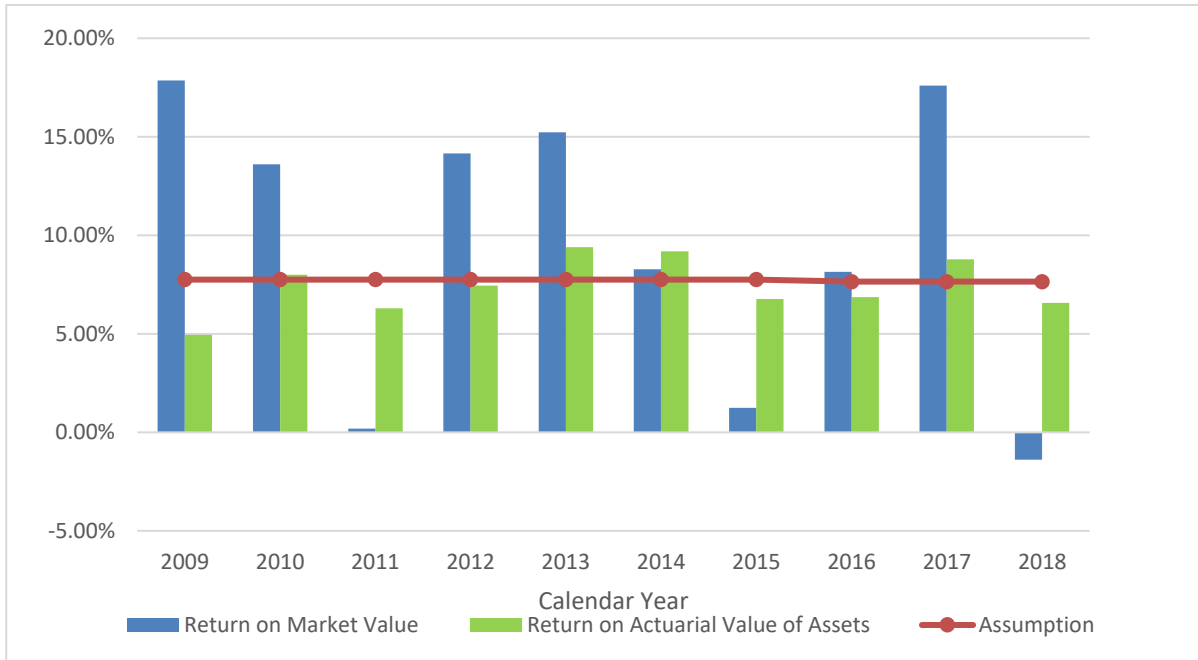
The preliminary Actuarial Value of Assets is the prior year's Actuarial Value of Assets, plus contributions and receipts, minus benefit payments and expenses, plus expected investment earnings. An adjustment equal to 20% of the excess of the Market Value of Assets at the end of the year over the preliminary Actuarial Value of Assets is added to the preliminary Actuarial Value of Assets. The Actuarial Value of Assets is further constrained to be within 20% of the market value of assets.

1. Valuation Date	1/1/2019	1/1/2018	1/1/2017
Actuarial Value of Assets, prior year	136,189,711	\$127,768,425	\$122,194,974
a. Prior Year Contributions and Receipts	9,270,333	9,137,270	8,357,205
b. Prior Year Benefit Payments and Expenses	(12,258,490)	(11,816,827)	(11,083,350)
c. Average Actuarial Value of Assets	134,695,633	126,428,647	120,831,902
d. Expected Investment Return Rate	7.65%	7.65%	7.65%
e. Expected Investment Income	10,304,216	9,671,791	9,243,641
f. Preliminary Actuarial Value of Assets	143,505,770	134,760,659	128,712,470
g. Market Value of Assets as of end of year	136,261,047	141,905,918	123,992,243
h. Adjustment toward Market Value	(1,448,945)	1,429,052	(944,045)
i. Actuarial Value of Assets, before corridor	142,056,825	136,189,711	127,768,425
2. Actuarial Value of Assets			
a. Actuarial Value of Assets, before corridor	\$142,056,825	\$136,189,711	\$127,768,425
b. 80% of Market Value of Assets	109,008,838	113,524,734	99,193,795
c. 120% of Market Value of Assets	163,513,256	170,287,102	148,790,692
d. Actuarial Value of Assets, a., but not less than b. and not greater than c.	142,056,825	136,189,711	127,768,425
e. Ratio of Actuarial Value of Assets to Market Value of Assets	104.25%	95.97%	103.05%
3. Rate of Return on Actuarial Value of Assets for Prior Calendar Year	6.57%	8.78%	8.78%

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Below are the investment returns during the last 10 years. The red line reflects the investment return actuarial assumption. Blue bars indicate investment return rates on market value of assets, and green bars show investment return rates on actuarial value of assets.



SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.2 - Actuarial Present Value of Future Benefits

The **Actuarial Present Value of Future Benefits** is the present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money. Below is the Actuarial Present Value of Future Benefits from the current valuation and the prior valuation:

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>
Actives	\$115,754,770	\$104,858,387
Retired Members and Beneficiaries	98,194,072	86,975,646
Disabled Members	14,976,753	15,559,675
Inactive Members	1,285,478	1,117,296
Total Present Value of Future Benefits	\$230,211,073	\$208,511,004

Exhibit 2.3 - Actuarial Accrued Liability

The **Actuarial Accrued Liability** is the portion of the Actuarial Present Value of Future Benefits which is allocated to all periods prior to a valuation year and therefore is not provided for by future Normal Costs. Below is the Actuarial Accrued Liability from the current valuation and the prior valuation:

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>
Actives	\$74,972,034	\$69,495,124
Retired Members and Beneficiaries	98,194,072	86,975,646
Disabled Members	14,976,753	15,559,675
Inactive Members	1,285,478	1,117,296
Total Actuarial Accrued Liability	\$189,428,337	\$173,147,741

Exhibit 2.4 - Unfunded Actuarial Accrued Liability

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>
Unfunded Actuarial Accrued Liability		
a. Actuarial Accrued Liability	\$189,428,337	\$173,147,741
b. Actuarial Value of Assets	142,056,825	127,768,425
c. Unfunded Actuarial Accrued Liability (a. - b.)	\$47,371,512	\$45,379,316
d. Funded Ratio (b. divided by a.)	75.0%	73.8%

SECTION 2 - PRINCIPAL VALUATION RESULTS

Below are the accrued liabilities, asset values (actuarial and market) and funded status during the last 10 years. The black solid line reflects the funded status on an actuarial value of assets (AVA) basis and the black dotted line reflects the funded status on a market value (MVA) basis. Blue bars indicate actuarial accrued liabilities, red bars indicate actuarial value of assets and green bars indicate market value of assets.

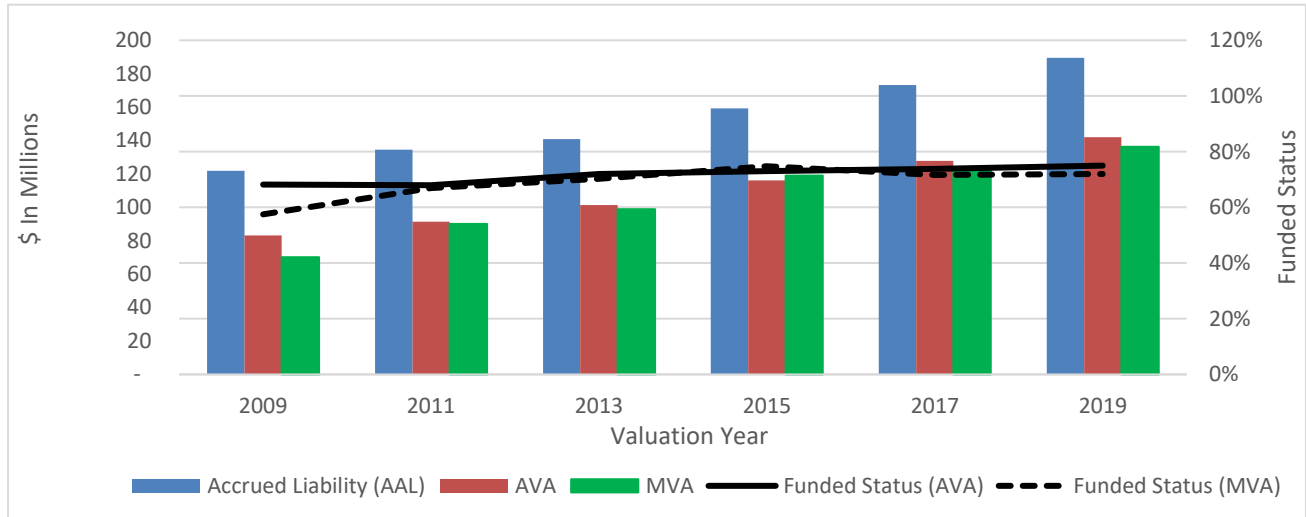


Exhibit 2.5 - Normal Cost

The **Normal Cost** is the portion of the Actuarial Present Value of Future Benefits which is allocated to a valuation year. Only active employees who have not reached Normal Retirement Age incur a Normal Cost. Below is the Normal Cost from the current valuation and the prior valuation:

Valuation Date	<u>1/1/2019</u>	<u>1/1/2017</u>
Total Normal Cost	\$4,321,147	\$3,591,977
As of Percentage of Salary	15.8%	14.4%
Employee Normal Cost	\$2,716,589	\$2,400,321
As of Percentage of Salary	9.9%	9.6%
Administrative Expenses	\$200,000	\$175,000
As a Percentage of Salary	0.7%	0.7%
Net Employer Normal Cost	\$1,804,558	\$1,366,656
As a Percentage of Salary	6.6%	5.5%

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.6 - Actuarial Experience

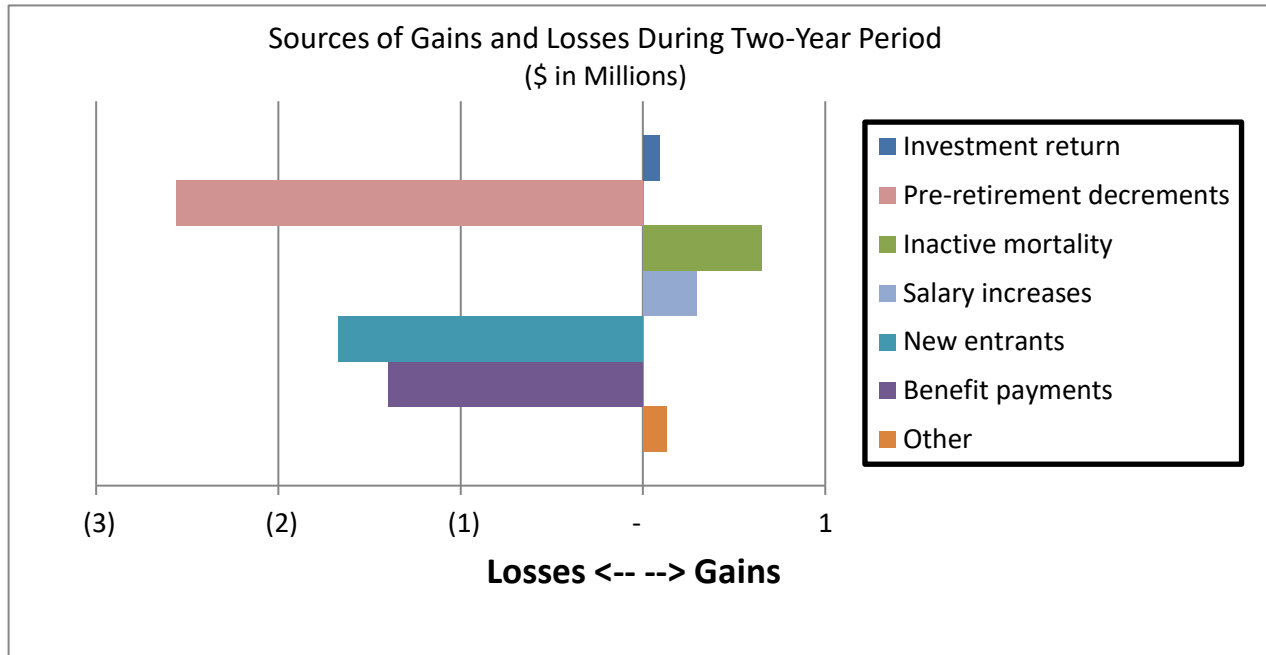
In performing the actuarial valuation, various assumptions are made regarding mortality, retirement, disability and withdrawal rates as well as salary increases and investment returns. A comparison of the results of the current valuation and the prior valuation is made to determine how closely actual experience relates to expected. During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease by \$4,619,574. Below is the development of the Actuarial Loss for the current 2-year period:

Calendar Year Ending	<u>12/31/2018</u>	<u>12/31/2017</u>
Expected Unfunded Actuarial Accrued Liability		
a. Unfunded Actuarial Accrued Liability, beginning of year	\$43,230,826	\$45,379,316
b. Normal cost, beginning of year	\$3,573,322	\$3,591,977
c. Total contributions	9,270,333	9,137,270
d. Interest (full year on a. and b., one-half year on c.)	3,225,927	3,396,803
e. Expected Unfunded Actuarial Accrued Liability	\$40,759,742	\$43,230,826
f. Unfunded Actuarial Accrued Liability (before changes)	45,223,571	
g. (Gain)/Loss	\$4,463,829	
Asset (gain)/loss		
a. Actuarial value of assets, beginning of year	\$136,189,711	\$127,768,425
b. Contributions and Receipts	9,270,333	9,137,270
c. Benefit Payments and Expenses	(12,258,490)	(11,816,827)
d. Assumed rate of return (prior valuation)	7.65%	7.65%
e. Expected return	10,304,216	9,671,791
f. Actuarial value of assets, end of year	142,056,825	136,189,711
g. Actual return	8,855,271	11,100,843
h. Actual rate of return	6.57%	8.78%
i. Asset (gain)/loss	\$1,448,945	(\$1,429,052)
j. Total asset (gain)/loss, 2-year period	(\$89,429)	

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.6 - Actuarial Experience

Below are the various sources of gains and losses over the 2-year period. The asset gain during the period was \$89,429, and the total demographic loss during the period was \$4,553,258, which totals to an overall loss of \$4,463,829.



Actual Unfunded Actuarial Accrued Liability

a. Changes due to:	
i) Asset (gain)/loss	(\$89,429)
ii) (Gain)/loss from demographic experience	4,553,258
iii) (Gain)/loss prior to changes	4,463,829
iv) Plan change	1,637,781
v) Assumption change	510,160
vi) Total (gain)/loss (including changes)	6,611,770
b. Unfunded Actuarial Accrued Liability, end of year	\$47,371,512

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.1 - Annual Appropriations

The **Annual Appropriation** is determined in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws ("M.G.L."). The appropriation is comprised of the annual employer normal cost and amortization payments to pay the unfunded actuarial accrued liability. Below are the details of the annual appropriations for the current and prior valuations, adjusted for semi-annual payments made each August 1 and December 31. The appropriations shown are based on the results of the valuations and do not account for any adjustments made to appropriations in the selected funding schedule.

Amortization Payments	<u>1/1/2019</u>	<u>1/1/2017</u>
a. Unfunded Actuarial Accrued Liability		
Fully Funded Year	2029	2029
Balance as of valuation date	\$47,371,512	\$45,379,316
Amortization Amount	\$5,362,877	\$4,429,293
Increasing Rate	4.50%	4.50%
Remaining Payment Period (from Valuation date)	10	12
b. Total Amortization Payments	\$5,362,877	\$4,429,293
Normal Cost	\$1,804,558	\$1,366,656
Net 3(8)(c) Transfers	\$0	\$0
Total Appropriation as of January 1	\$7,167,435	\$5,795,949
Adjusted for Payments as of August 1 and December 31	\$7,565,700	\$6,124,369

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibits 3.2 and 3.3 are based on the assumptions below:

Exhibit 3.2:

- The Employer Normal Cost is expected to increase 4% per year.
- The Unfunded Actuarial Accrued Liability ("UAL") is computed as of January 1 of each year assuming no future gains or losses.
- The Amortization Payment of UAL is an increasing payment at 4.5% paid over 10 years through 2029.
- Total Employer Cost is the sum of the Employer Normal Cost and the Amortization of the UAL, both computed as of January 1 of each year and adjusted for semi-annual payments made on August 1 and December 31.
- For fiscal year 2020, we show the actual appropriation developed under the previous funding schedule of \$6,282,942. For fiscal years 2021 and later, the Board has selected a funding schedule that fully amortizes the unfunded actuarial accrued liability by 2029, with annual employer costs limited to increases of 6% over the prior year, excluding fiscal year 2021. The FY2021 appropriation is further reduced by \$283,437.

Exhibit 3.3:

- Expected benefit payments include payments expected to be made to retired members, beneficiaries, disabled members and active members expected to retire. In addition, expected benefit payments include distribution of the annuity savings fund attributed to inactive members.
- Benefit payments exclude cost-of-living increases granted to members in pay status between 1982 and 1997. In addition, benefit payments are as expected for the first ten years of the forecast, then increase by the greater of 4.5% per year thereafter or the expected future payments for the current population projected by our computer model.
- Calendar year cash flow entries are developed as of each January 1.

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.2 - 30-Year Forecast of Annual Appropriations

Fiscal Year Ending	Total Normal Cost	Amortization Payment of UAL	Total Employer Cost	Increase over Prior Year	Unfunded Actuarial Accrued Liability
2020	\$1,904,830	\$4,378,112	\$6,282,942		\$47,371,512
2021	1,981,023	5,622,158	7,603,181	21.01%	46,465,658
2022	2,060,264	5,999,108	8,059,372	6.00%	44,224,914
2023	2,142,674	6,400,260	8,542,934	6.00%	41,432,225
2024	2,228,381	6,827,129	9,055,510	6.00%	38,021,547
2025	2,317,516	7,281,325	9,598,841	6.00%	33,920,339
2026	2,410,217	7,764,554	10,174,771	6.00%	29,048,983
2027	2,506,626	8,278,631	10,785,257	6.00%	23,320,149
2028	2,606,891	8,825,481	11,432,372	6.00%	16,638,111
2029	2,711,166	9,407,148	12,118,314	6.00%	8,898,002
2030	2,819,613	-	2,819,613	-76.73%	-
2031	2,932,397	-	2,932,397	4.00%	-
2032	3,049,693	-	3,049,693	4.00%	-
2033	3,171,680	-	3,171,680	4.00%	-
2034	3,298,548	-	3,298,548	4.00%	-
2035	3,430,490	-	3,430,490	4.00%	-
2036	3,567,709	-	3,567,709	4.00%	-
2037	3,710,418	-	3,710,418	4.00%	-
2038	3,858,835	-	3,858,835	4.00%	-
2039	4,013,188	-	4,013,188	4.00%	-
2040	4,173,715	-	4,173,715	4.00%	-
2041	4,340,664	-	4,340,664	4.00%	-
2042	4,514,291	-	4,514,291	4.00%	-
2043	4,694,863	-	4,694,863	4.00%	-
2044	4,882,657	-	4,882,657	4.00%	-
2045	5,077,964	-	5,077,964	4.00%	-
2046	5,281,083	-	5,281,083	4.00%	-
2047	5,492,326	-	5,492,326	4.00%	-
2048	5,712,019	-	5,712,019	4.00%	-
2049	5,940,499	-	5,940,499	4.00%	-

Reading Contributory Retirement System
Actuarial Valuation as of January 1, 2019

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.3 - 30-Year Forecast of Cash Flow

Calendar Year	Market Value of Assets, BOY	Benefit Payments	Employee Contributions	Employer Contributions	Investment Return	Market Value of Assets, EOY
2019	\$136,261,047	\$13,435,888	\$2,716,589	\$5,952,202	\$10,365,892	\$141,859,842
2020	141,859,842	12,652,909	2,825,253	7,202,943	10,917,119	150,152,248
2021	150,152,248	13,171,044	2,938,263	7,635,119	11,560,508	159,115,094
2022	159,115,094	13,665,401	3,055,794	8,093,226	12,257,356	168,856,069
2023	168,856,069	14,268,260	3,178,026	8,578,820	13,010,909	179,355,564
2024	179,355,564	14,699,019	3,305,147	9,093,549	13,830,356	190,885,597
2025	190,885,597	15,193,183	3,437,353	9,639,162	14,727,414	203,496,343
2026	203,496,343	15,682,342	3,574,847	10,217,511	15,708,565	217,314,924
2027	217,314,924	16,189,857	3,717,841	10,830,562	16,782,630	232,456,100
2028	232,456,100	16,576,915	3,866,555	11,466,450	17,962,549	249,174,739
2029	249,174,739	17,010,567	4,021,217	2,671,186	18,552,139	257,408,714
2030	257,408,714	17,776,043	4,182,066	2,778,033	19,161,059	265,753,829
2031	265,753,829	18,575,965	4,349,349	2,889,154	19,777,826	274,194,193
2032	274,194,193	19,411,883	4,523,323	3,004,720	20,401,222	282,711,575
2033	282,711,575	20,285,418	4,704,256	3,124,909	21,029,852	291,285,174
2034	291,285,174	21,198,262	4,892,426	3,249,906	21,662,128	299,891,372
2035	299,891,372	22,152,184	5,088,123	3,379,902	22,296,248	308,503,461
2036	308,503,461	23,149,032	5,291,648	3,515,098	22,930,177	317,091,352
2037	317,091,352	24,190,738	5,503,314	3,655,702	23,561,625	325,621,255
2038	325,621,255	25,279,321	5,723,447	3,801,930	24,188,023	334,055,334
2039	334,055,334	26,416,890	5,952,385	3,954,007	24,806,496	342,351,332
2040	342,351,332	27,605,650	6,190,480	4,112,168	25,413,837	350,462,167
2041	350,462,167	28,847,904	6,438,099	4,276,655	26,006,473	358,335,490
2042	358,335,490	30,146,060	6,695,623	4,447,721	26,580,435	365,913,209
2043	365,913,209	31,502,633	6,963,448	4,625,630	27,131,323	373,130,977
2044	373,130,977	32,920,251	7,241,986	4,810,655	27,654,262	379,917,629
2045	379,917,629	34,401,662	7,531,665	5,003,082	28,143,866	386,194,580
2046	386,194,580	35,949,737	7,832,932	5,203,205	28,594,189	391,875,169
2047	391,875,169	37,567,475	8,146,249	5,411,333	28,998,676	396,863,952
2048	396,863,952	39,258,011	8,472,099	5,627,786	29,350,112	401,055,938

Reading Contributory Retirement System
Actuarial Valuation as of January 1, 2019

SECTION 4 - REQUIRED DISCLOSURES

Exhibit 4.1 - GASB 67 and GASB 68 Disclosures

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, *Financial Reporting for Pension Plans*, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions*, replaced the requirements of Statement No. 27.

The new pension standards reflect changes from those currently in place regarding how governments calculate total pension liability and pension expense. Further, the new standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

GASB 67 requires defined benefit pension plans, such as the Reading Contributory Retirement System, to present a statement of fiduciary net position (pension plan assets) and a statement of changes in fiduciary net position. Further, the statement requires that notes to financial statements include descriptive information such as the types of benefits provided, the classes of plan members covered and the composition of the pension plan's retirement board. Finally, GASB 67 requires pension plans to present in required supplementary information the sources of the changes in the net pension liability and information about the actuarially determined contributions compared with the actual contributions made to the plan and related ratios.

GASB 67 and GASB 68 require projected benefit payments be discounted to their actuarial present value using the single rate that reflects:

- (1) a long-term expected rate of return on pension plan investments *to the extent that the pension plan's assets are sufficient to pay benefits and pension plan assets are expected to be invested using a strategy to achieve that return and*
- (2) a tax-exempt, high-quality municipal bond rate *to the extent that the conditions for use of the long-term expected rate of return are not met.*

GASB 68 establishes standards for measuring and recognizing liabilities, deferred outflows of resources, deferred inflows of resources and pension expense by state and local governments.

The effective date for GASB 67 is for plan years beginning after June 15, 2013, which is fiscal year ending December 31, 2014 for the Reading Contributory Retirement System. The effective date for GASB 68 is for employers' fiscal years beginning after June 15, 2014. The GASB report, submitted under separate cover and prepared as of December 31, 2018 (the measurement date), presents information to assist the Reading Contributory Retirement System in providing the required information under GASB 68 to participating employers.

SECTION 4 - REQUIRED DISCLOSURES

Exhibit 4.2 - PERAC Disclosure Information

The most recent actuarial valuation of the System was prepared by KMS Actuaries, LLC as of January 1, 2019.

The normal cost for employees on that date was:	\$2,716,589	9.9% of payroll
The normal cost for the employer was:	\$1,804,558	6.6% of payroll

The actuarial liability for active members was:	\$74,972,034
The actuarial liability for retired and inactive members was:	114,456,303
Total actuarial liability:	\$189,428,337
System assets as of that date:	\$142,056,825
Unfunded actuarial accrued liability:	\$47,371,512

The ratio of System assets to total actuarial accrued liability was:	75.0%
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The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.50%
Rate of Salary Increase:	Based on service, 6% graded down to 4.25% for Group 1
	Based on service, 7% graded down to 4.75% for Group 4

SECTION 4 - DISCLOSURES

Exhibit 4.3 - Risk Measures

The Reading Contributory Retirement System is subject to certain risks that could affect the plan's future financial condition. Here we identify the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks in accordance with Actuarial Standards of Practice (ASOP) 51.

Risk is the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience. Examples of potential risks that may be reasonably anticipated to significantly affect the future financial condition of the plan include the following:

- ◆ **Investment risk** - the potential that investment returns will be different than expected.
- ◆ **Asset/liability mismatch risk** - the potential that changes in asset values are not matched by changes in the value of liabilities.
- ◆ **Interest rate risk** - the potential that interest rates will be different than expected.
- ◆ **Longevity and other demographic risks** - the potential that mortality or other demographic experience will be different than expected.
- ◆ **Contribution risk** - the potential of actual future contributions deviating from expected future contributions. For example, that actual contributions are not made in accordance with the plan's funding policy, that other anticipated payments to the plan are not made, or that material changes occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base.

We have provided several risk measures in this section that we believe are most significant for the plan. However, we recommend a more detailed assessment of risk would be beneficial to the Board to understand the risks identified above, such as:

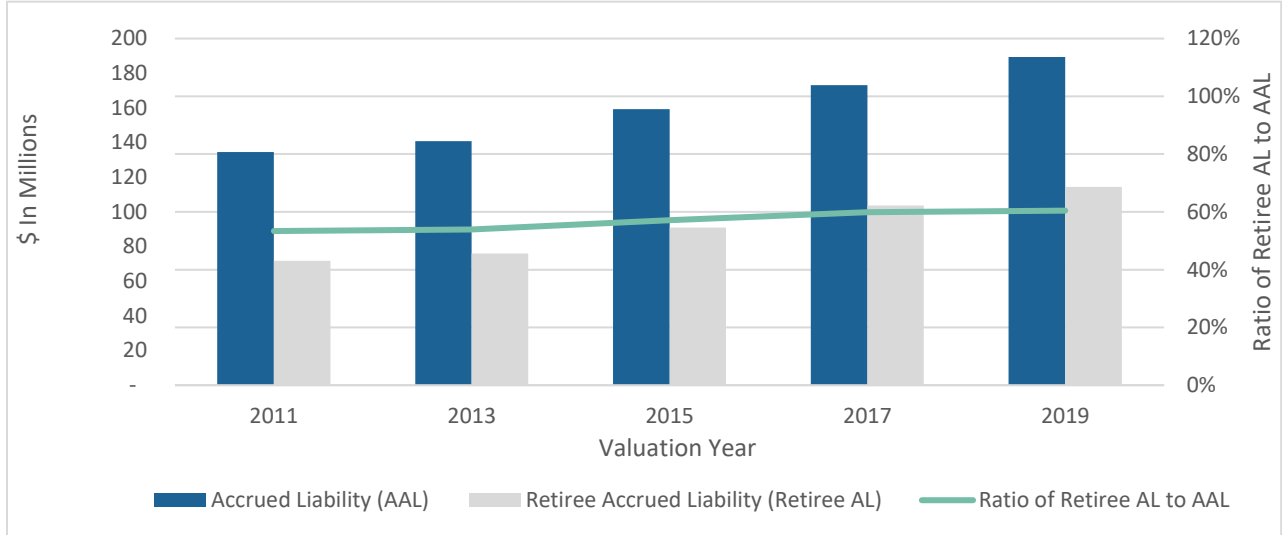
- ◆ **Scenario Test** - a process for assessing the impact of one possible event, or several simultaneous or sequentially occurring possible events, on a plan's financial condition.
- ◆ **Sensitivity Test** - a process for assessing the impact of a change in an actuarial assumption on an actuarial measurement.
- ◆ **Stochastic Modeling** - a process for generating numerous potential outcomes by allowing for random variations in one or more inputs over time for the purpose of assessing the distribution of those outcomes.
- ◆ **Stress Test** - a process for assessing the impact of adverse changes in one or relatively few factors affecting a plan's financial condition.

SECTION 4 - DISCLOSURES

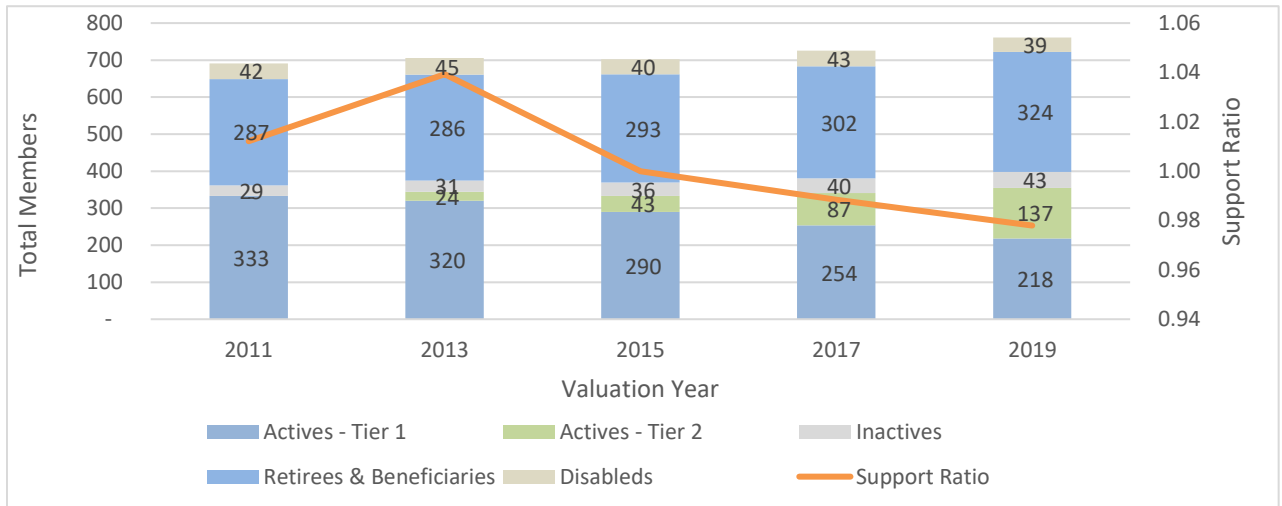
Exhibit 4.3 - Risk Measures

Maturity Measures

As retirement systems mature they become much more sensitive to risks than systems that are less mature. Plan maturity measures are helpful in understanding the risks associated with a plan. One such maturity measure is the ratio of the system's retiree liability to its total liability. A retirement system in its infancy will have a very low ratio of retiree liability to total liability. As the system matures, the ratio starts increasing. A mature plan will often have a ratio above 60%. For the Reading Contributory Retirement System and other retirement systems in the United States these ratios have been steadily increasing in recent years.



Another maturity measure is the ratio of actives to retirees, or support ratio. A retirement system in its infancy will have a very high ratio of active to retired members. As the system matures, and members retire, the support ratio starts declining. A mature system will often have a support ratio near or below one.



SECTION 4 - DISCLOSURES

Exhibit 4.3 - Risk Measures

Volatility Indices

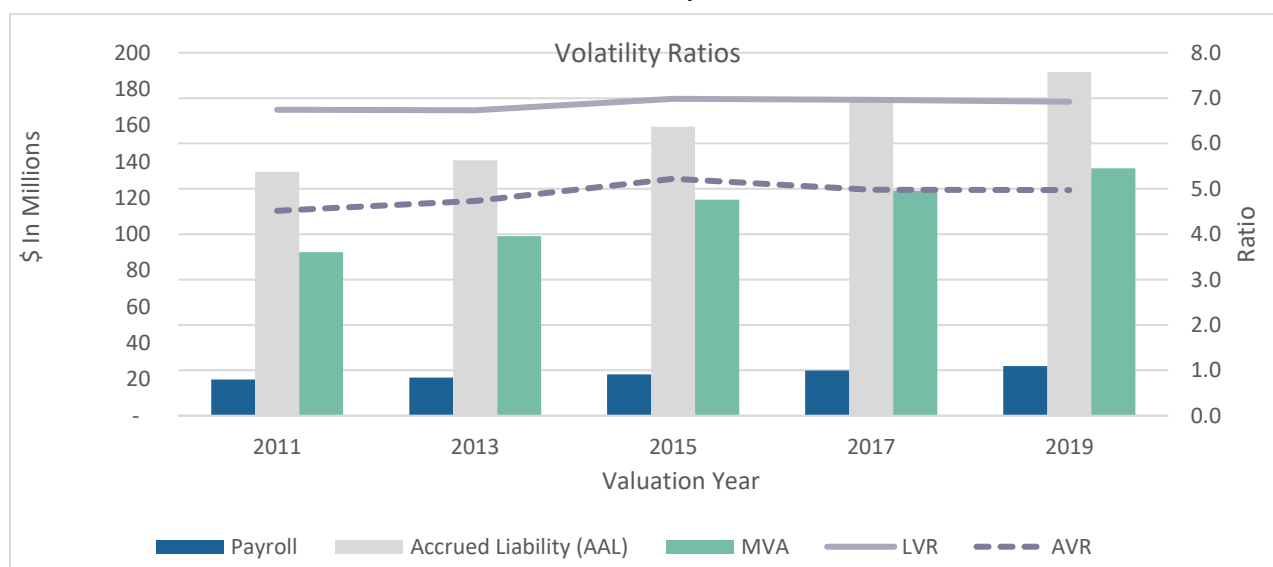
Volatility indices are measures of the relative sensitivity of employer contributions to changes in assets or liabilities. Below we present two such indices - the Asset Volatility Ratio (AVR) and the Liability Volatility Ratio (LVR):

Asset Volatility Ratio (AVR)

The Asset Volatility Ratio (AVR) is the ratio of the Market Value of Assets (MVA) to Payroll. Systems with a higher AVR experience more volatile employer contributions (as a percentage of payroll) due to investment return. This ratio indicates a measure of the system's current contribution volatility. The AVR increases over time but generally tends to stabilize as the system matures.

Liability Volatility Ratio (LVR)

The Liability Volatility Ratio (LVR) is the ratio of the Actuarial Accrued Liability (AAL) to Payroll. Systems with a higher LVR experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. This ratio indicates a longer-term potential for contribution volatility. The AVR, described above, will tend to move close to the LVR as the system matures.

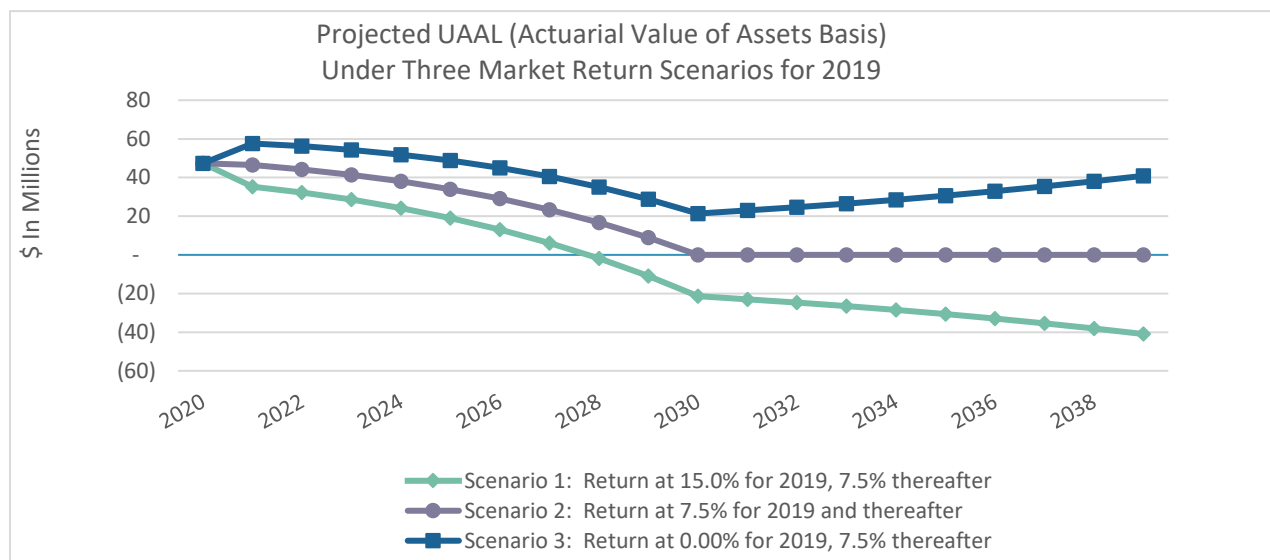


SECTION 4 - DISCLOSURES

Exhibit 4.3 - Risk Measures

Market Return Scenarios

Below we illustrate the projected effect on funding levels of a single year of investment return above or below the assumed investment return. Scenario 1 assumes a one-year return of 2 times the assumed return and the expected return thereafter, Scenario 2 assumes assets earn the expected return every year and Scenario 3 assumes a one-year return of 0% and the expected return thereafter.



Sensitivity Analysis

The following presents the Actuarial Accrued Liability and Funded Status calculated using the investment return rate of 7.5%, as well as what the Actuarial Accrued Liability and Funded Status would be if it were calculated using an investment return rate 1-percentage point lower (6.5%) or 1-percentage point higher (8.5%) than the assumed investment return rate:

	1% Decrease (6.5%)	Current Investment Return Rate (7.5%)	1% Increase (8.5%)
Actuarial Accrued Liability	\$210,324,299	\$189,428,337	\$171,689,740
% Change	11%		-9%
Actuarial Value of Assets	\$142,056,825	\$142,056,825	\$142,056,825
Unfunded Actuarial Accrued Liability	68,267,474	47,371,512	29,632,915
% Change	44%	N/A	-37%
Funded Status	67.54%	74.99%	82.74%

SECTION 4 - DISCLOSURES

Exhibit 4.3 - Risk Measures

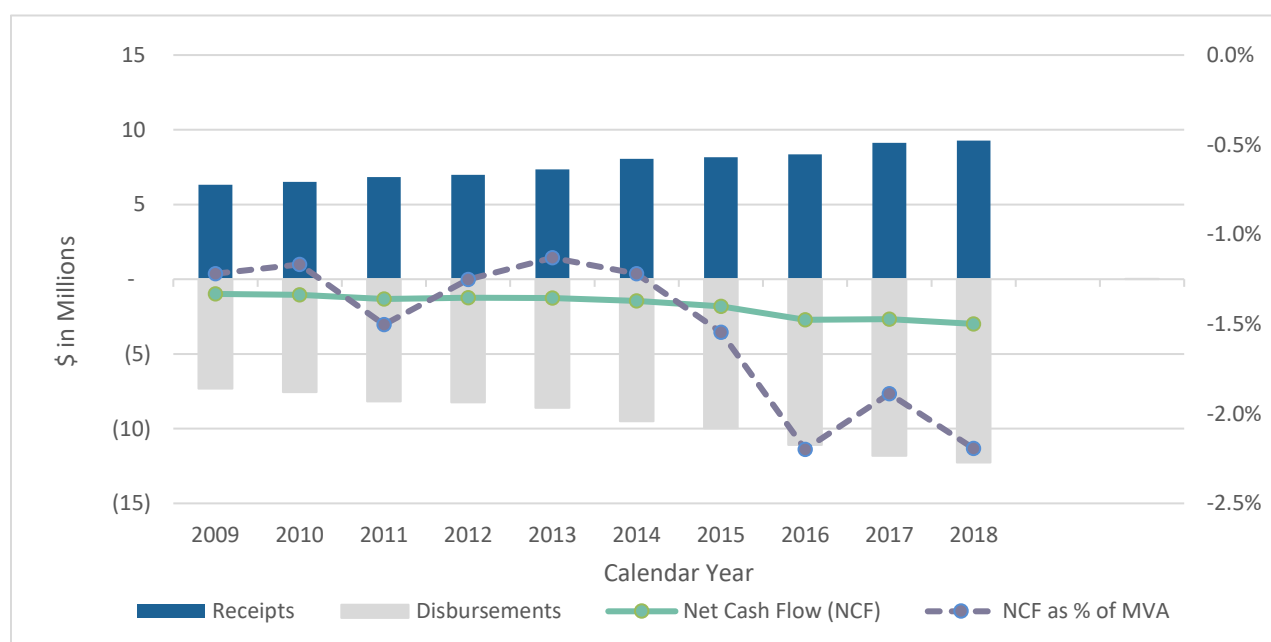
Duration

Duration is another measure that is used to describe how the present value of a cash flow series changes when small changes are made to the underlying interest rates. The duration of the Reading Contributory Retirement System is 10, and this represents an approximate percentage change in the Actuarial Accrued Liability for each 1% change to the investment return rate.

Net Cash Flow (NCF)

Net cash flow (NCF) during a year is the difference between contributions, both employer and employee, into the System and benefit payments and expenses. If the level of benefit payments plus expenses is greater than contributions, then the System has negative NCF. Mature plans generally have a negative NCF as the number of retirees grows. When a System has negative NCF, then additional cash from existing assets are needed to pay the pension benefits.

Historical NCF since 2009 is shown in the next graph. Blue bars indicate contributions, from employees and employers, and grey bars show benefit payments and administrative expenses. The NCF is represented by the green line. The dashed purple line (which corresponds to the right-hand axis) provides the NCF as a percentage of the Market Value of Assets. As of December 31, 2018, the NCF was negative \$3. million, which represents 2.2% of the Market Value of Assets. The NCF falls within the range of -2.2% to -1.1% of total assets over the 10-year period.



SECTION 5 - SUMMARY OF PLAN PROVISIONS

Administration There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws and other applicable statutes. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

Participation Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the local retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are four classes of membership in the Retirement System:

- | | |
|----------|--|
| Group 1: | General employees, including clerical, administrative, technical and all other employees not otherwise classified. |
| Group 2: | Certain specified hazardous duty positions. |
| Group 3: | State police officers and inspectors. |
| Group 4: | Local police officers, firefighters and other specified hazardous positions. |

For members in more than one group, participation will be proportional.

Member Contributions Member contributions vary depending on the most recent date of membership:

Prior to 1975:	5% of Salary
1975 – 1983:	7% of Salary
1984 – June 30, 1996:	8% of Salary
July 1, 1996 – present:	9% of Salary
1979 – present:	An additional 2% of Salary in excess of \$30,000.
Group 1 members hired on or after April 2, 2012:	6% of Salary with 30 or more years of creditable service.

Rate of Interest Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least ten financial institutions.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Retirement Age	The mandatory retirement age for some Group 2 and Group 4 members is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for members in Group 1.
Salary	Gross regular compensation. This does not include bonuses, overtime, severance pay, unused sick leave credit or other similar compensation.
Average Salary	<p>Membership before April 2, 2012: Average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.</p> <p>Membership on or after April 2, 2012: Average annual rate of regular compensation received during the five consecutive years that produce the highest average, or, if greater, during the last five years (whether or not consecutive) preceding retirement.</p>
Creditable Service	The period during which a member contributes to the retirement system plus certain periods of military service and "purchased" service.
Benefit Rate	The benefit rate varies with the member's retirement age, Group, membership date and years of creditable service at retirement. Each year a member retires prior to the age at which the 2.5% maximum benefit rate applies, a reduction is applied to each year of age under the maximum age. The maximum age and reduction for each Group and membership date is as follows:

	Group 1	Group 2	Group 4
2.5% for Membership before April 2, 2012:			
Maximum age:	65	60	55
Reduction:	0.1%	0.1%	0.1%
2.5% for Membership on or after April 2, 2012 (less than 30 years of service):			
Maximum age:	67	62	57
Reduction:	0.15%	0.15%	0.15%
2.5% for Membership on or after April 2, 2012 (30+ years of service):			
Maximum age:	67	62	57
Reduction:	0.125%	0.125%	0.125%

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Superannuation Retirement	Eligibility if membership before April 2, 2012:	<ul style="list-style-type: none">• completion of 20 years of Creditable Service, or• attainment of age 55 if hired prior to 1978, or• attainment of age 55 with 10 years of Creditable Service, if hired after 1978.
	Eligibility if membership on or after April 2, 2012:	<ul style="list-style-type: none">• attainment of age 60 with 10 years of Creditable Service if classified in Group 1• attainment of age 55 with 10 years of Creditable Service if classified in Group 2• attainment of age 55 if classified in Group 4
	Benefit Amount	Product of the member's Benefit Rate, Average Salary and Creditable Service.
	Maximum Benefit	80% of the member's Average Salary.
	Veteran's Benefit	Additional benefit of \$15 per year of Creditable Service, up to a maximum of \$300.
Deferred Vested	Eligibility	<ul style="list-style-type: none">• completion of ten or more years of Creditable Service.• elected officials hired prior to 1978, completion of six years of Creditable Service.
	Benefit Amount	Accrued benefit payable commencing at age 55, or the completion of 20 years of Creditable Service, or may be deferred until later at the participant's option.
Withdrawal of Contributions		<p>Contributions may be withdrawn upon termination of employment.</p> <ul style="list-style-type: none">• Members hired on or after January 1, 1984 who terminate with less than ten years of Creditable Service receive contributions plus interest on the Annuity Savings Account at an annual rate of 3%.• All other withdrawals receive contributions plus 100% of the regular interest that has accrued to the Annuity Savings Account.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Ordinary Disability Retirement	Eligibility	Non-job related disability after completion of ten years of Creditable Service.
	Benefit Amount for Group 1 membership before April 2, 2012 or Group 2 or Group 4	Superannuation benefit determined if the member is age 55, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
	Benefit Amount for Group 1 membership on or after April 2, 2012	Superannuation benefit determined if the member is age 60, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
Accidental Disability Retirement	Eligibility	Disabled as a result of an accident in the performance of duties. There is no minimum age or service requirement.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of \$15 per year of Creditable Service, up to a maximum of \$300.
	Supplemental Dependent Allowance	Additional allowance of \$897.72 per year for each child until age 18 (or age 22 if a full-time student).
Non-Occupational Death	Eligibility	For members with at least two years of creditable service who die while in active service, but not due to occupational injury.
	Benefit Amount	Benefit as if Option C had been elected. Minimum benefit of \$250 per month for surviving spouse, \$120 per month for first child and \$90 per month for each additional child.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Accidental Death	Eligibility	For members who die as a result of an occupational injury.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of \$15 per year of creditable service, up to a maximum of \$300.
	Supplemental Dependent Allowance	Additional allowance of \$897.72 per year for each child until age 18 (or age 22 if a full-time student).
Cost-of-Living Adjustment (COLA)	In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a Cost-of-Living Adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees and beneficiaries who have been receiving benefit payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is \$14,000. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the Commonwealth of Massachusetts and are not the liability of the Retirement System.	
Optional Forms of Payment	A member may elect to receive his or her retirement allowance, payable in monthly installments, in one of three forms of payment: <ul style="list-style-type: none">• Option A – Total annual allowance commencing at retirement and terminating at member's death.• Option B – A reduced annual allowance commencing at retirement with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member.• Option C – A reduced annual allowance commencing at retirement with 66⅔% of benefit continued to designated beneficiary upon death of member. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement.	

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Valuation Date January 1, 2019

Investment Return 7.50% per year. Previously, 7.65% per year.
The investment return assumption is a long-term assumption based on capital market expectations by asset class, historical returns and professional judgment. We considered analysis prepared by PRIM's investment advisor using a building block approach and using the target asset allocation, expected returns by asset class and risk analysis to determine a long-term expected average annual rate of return.

Annuity Savings Fund Interest Rate 2.00% per year

Amortization Method *Unfunded Actuarial Accrued Liability (UAL):*
Increasing dollar amount at 4.5% to reduce the Unfunded Actuarial Accrued Liability to zero on or before June 30, 2029.

The increase in annual appropriation is limited to 5% increase over the prior year beginning in 2022.

Salary Scale The assumed annual rates for salary increases including longevity are illustrated by the following rates:

Years of Service	Groups 1 and 2	Group 4
0	6.00%	7.00%
1	5.50%	6.50%
2	5.50%	6.00%
3	5.25%	5.75%
4	5.25%	5.25%
5	4.75%	5.25%
6	4.75%	4.75%
7	4.50%	4.75%
8	4.50%	4.75%
9+	4.25%	4.75%

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations and professional judgment.

Cost-of-Living Allowance Cost-of-Living Allowances (COLA) are assumed to be 3% of the pension amount, capped at \$420 per year.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Mortality Rates

RP-2000 Mortality Table (base year 2009) with full generational mortality improvement using Scale BB. For disabled members, RP-2000 Mortality Table (base year 2012) with full generational mortality improvement using Scale BB.

General Employees: 55% of deaths are job-related.

Police and Fire : 90% of deaths are job-related.

The underlying tables with generational mortality improvement reasonably reflect the mortality experience of the System as of the valuation date based on historical and current demographic data. Further, PERAC reviewed a sampling of a few larger local retirement systems and compared the results with the results found in performing the analysis of the State Retirement System for years 2012 - 2014. For the State Retirement System analysis, the mortality assumptions reflect the recent experience study published in 2014.

Turnover Rates

Illustrative turnover rates are shown below:

Creditable Service	Groups 1 and 2	Group 4
0	0.1500	0.0150
10	0.0540	0.0150
20	0.0200	0.0000
30	0.0000	0.0000

Disability Rates

Illustrative disability rates are shown below:

Attained Age	Groups 1 and 2	Group 4
20	0.0001	0.0010
30	0.0003	0.0030
40	0.0010	0.0030
50	0.0019	0.0125
60	0.0028	0.0085

General Employees: 55% of disabilities are accidental and 45% are ordinary.

Police and Fire : 90% of disabilities are accidental and 10% are ordinary.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Retirement Rates

Illustrative retirement rates are shown below:

Age	Groups 1 and 2		Group 4
	Male	Female	Male & Female
45	0.0000	0.0000	0.0100
46	0.0000	0.0000	0.0100
47	0.0000	0.0000	0.0100
48	0.0000	0.0000	0.0100
49	0.0000	0.0000	0.0100
50	0.0100	0.0150	0.0200
51	0.0100	0.0150	0.0200
52	0.0100	0.0200	0.0200
53	0.0100	0.0250	0.0500
54	0.0200	0.0250	0.0750
55	0.0200	0.0550	0.1500
56	0.0250	0.0650	0.1000
57	0.0250	0.0650	0.1000
58	0.0500	0.0650	0.1000
59	0.0650	0.0650	0.1500
60	0.1200	0.0500	0.2000
61	0.2000	0.1300	0.2000
62	0.3000	0.1500	0.2500
63	0.2500	0.1250	0.2500
64	0.2200	0.1800	0.3000
65	0.4000	0.1500	1.0000
66	0.2500	0.2000	1.0000
67	0.2500	0.2000	1.0000
68	0.3000	0.2500	1.0000
69	0.3000	0.2000	1.0000
70	1.0000	1.0000	1.0000

The turnover, disability and retirement rates are based on PERAC's most recent experience analysis of local retirement systems which reviewed age, gender and job group. The assumptions reflect this analysis as well as professional judgment.

Actuarial Cost Method

Individual Entry Age Normal.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial Asset Method

The Actuarial Value of Assets is determined as follows:

- a) A preliminary Actuarial Value of Assets is developed and equals the Actuarial Value of Assets from the prior year plus contributions and receipts minus benefit payments and expenses plus expected investment earnings.
- b) An adjustment is added to a) that equals 20% of the excess of the Market Value at the end of the year over the preliminary Actuarial Value of Assets developed in a) above.
- c) The Actuarial Value of Assets is further constrained to be not less than 80% or more than 120% of Market Value.

Census Data

Census data as of the valuation date were submitted by the Retirement Board.

Asset Data

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Reading Contributory Retirement System.

Dependents

75% of all members will be survived by a spouse. Age assumption for spouses is that males are assumed to be three years older than females.

Administrative Expenses

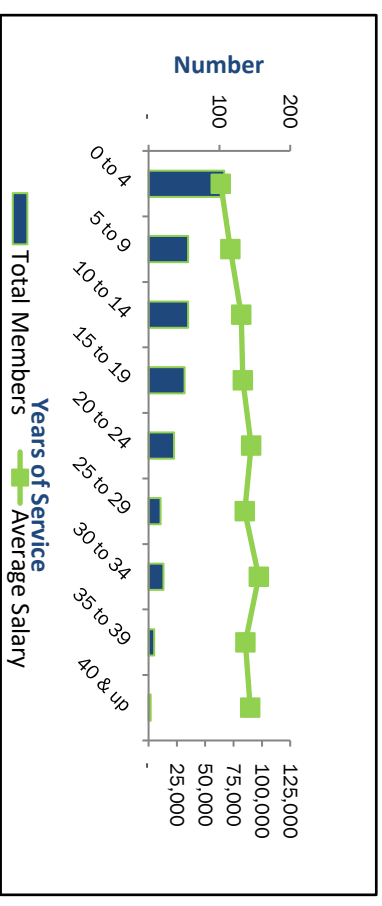
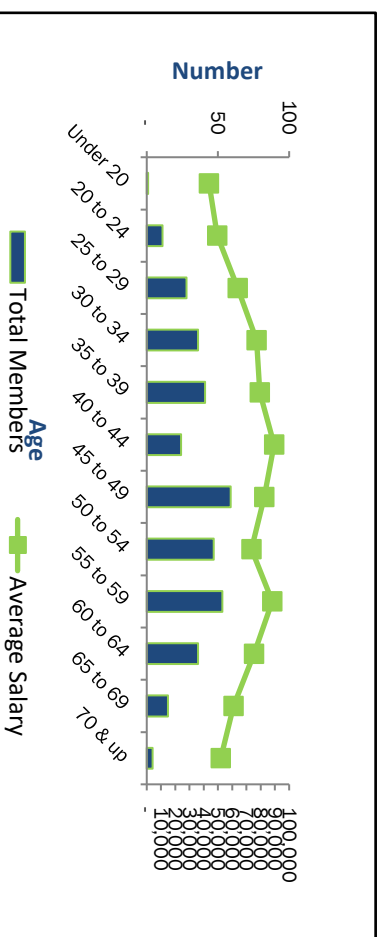
The anticipated administrative expenses for the fiscal year. For Fiscal Year 2020, the administrative expenses were assumed to be \$200,000 and are anticipated to increase 4% per year.

The administrative expense assumption is based on information relating to the System's administrative expenses provided by the Retirement System.

SECTION 7 - PLAN MEMBER INFORMATION

Exhibit 7.1 - ACTIVE MEMBERS BY AGE and YEARS OF SERVICE AS OF JANUARY 1, 2019

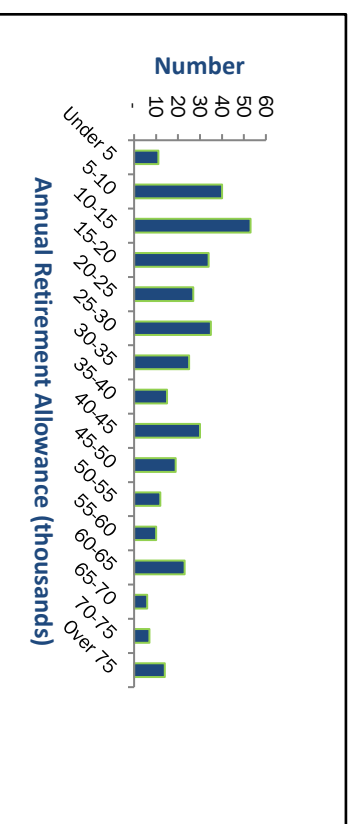
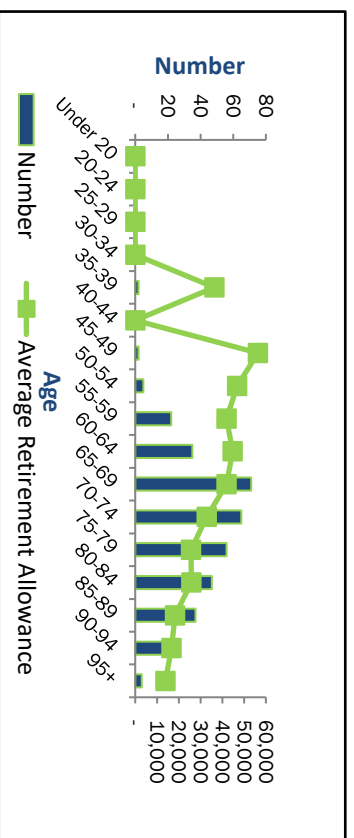
Age	Years of Service										Total	Total Salary	Average Salary
	0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up				
Under 20	1	-	-	-	-	-	-	-	-	1	43,765	43,765	
20 to 24	11	-	-	-	-	-	-	-	-	11	544,267	49,479	
25 to 29	23	5	-	-	-	-	-	-	-	28	1,785,640	63,773	
30 to 34	18	13	5	-	-	-	-	-	-	36	2,779,460	77,207	
35 to 39	11	7	16	7	-	-	-	-	-	41	3,250,681	79,285	
40 to 44	4	2	3	12	3	-	-	-	-	24	2,146,239	89,427	
45 to 49	11	7	10	14	14	3	-	-	-	59	4,867,648	82,503	
50 to 54	13	7	5	4	4	7	7	-	-	47	3,456,014	73,532	
55 to 59	9	7	9	7	5	4	8	4	-	53	4,673,193	88,173	
60 to 64	4	5	4	5	8	2	3	3	2	36	2,712,274	75,341	
65 to 69	1	2	4	2	1	1	2	1	1	15	914,295	60,953	
70 & up	1	1	-	-	1	-	1	-	-	4	208,009	52,002	
Total	107	56	56	51	36	17	21	8	3	355	27,381,485	77,131	
Average Salary	63,701	72,159	81,886	83,162	90,562	84,976	97,210	85,328	89,606				
Average Age:											46.98	Average Service:	
												12.76	



SECTION 7 - PLAN MEMBER INFORMATION

Exhibit 7.2 - Retired Plan Members and Beneficiaries Annual Pensions as of January 1, 2019

Attained Age	Service Retirements		Disability Retirements		Beneficiaries	
	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance
Under 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	0	0	1	62,209	1	10,434
40-44	0	0	0	0	0	0
45-49	0	0	2	112,781	0	0
50-54	0	0	4	202,689	1	31,378
55-59	17	725,833	4	186,269	1	9,124
60-64	31	1,401,337	3	127,912	1	35,651
65-69	57	2,557,392	10	324,562	4	91,574
70-74	55	1,849,854	3	92,560	7	195,172
75-79	44	1,157,837	6	163,997	6	116,953
80-84	40	1,082,365	3	75,517	4	55,181
85-89	25	455,485	3	73,046	9	148,313
90-94	11	189,497	0	0	6	95,015
95+	4	55,526	0	0	0	0
Total	284	9,475,126	39	1,421,542	40	788,795
Average Age	74.0		67.2		78.0	
Average Retirement Allowance		33,363		36,450		19,720



SECTION 8 - GLOSSARY OF TERMS

Actuarial Accrued Liability – That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

Actuarial Assumptions – Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the commencement, amount and duration of pension benefits, such as: changes in compensation, mortality, withdrawal, disablement and retirement; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

Actuarial Cost Method (or Funding Method) – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the current year (Normal Cost) and the past (Actuarial Accrued Liability).

Actuarial Gain or Loss (or Experience Gain or Loss) – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between the valuation date and the most recent immediately preceding valuation date.

Actuarial Present Value – The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

Amortization Payment – That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

Annual Statement – The statement submitted by the local retirement board to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

Annuity Reserve Fund – The fund into which total accumulated Member Contributions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

Annuity Savings Fund – The fund in which Member Contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

Assets – The total value of the investments held by the Plan trust that are for the payment of promised benefits. Employer appropriations and Member Contributions, as well as investment earnings, are added to the Plan trust. Benefit payments and other disbursements are withdrawn from the Plan trust. For valuation purposes, assets are usually measured at market value.

Cost of Benefits – The estimated payment from the pension system for benefits for the fiscal year.

SECTION 8 - GLOSSARY OF TERMS

Expense Fund – The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

Funding Schedule – The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB – Governmental Accounting Standards Board.

Normal Cost – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is expected to accrue in the current fiscal year. The Employee Normal Cost is the amount of the expected Member Contributions for the current fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

Pension Fund – The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

Pension Reserve Fund – The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

Present Value of Future Benefits – The actuarial present value of the cost to finance benefits payable in the future, discounted to reflect the expected effects of the time value of money and the probabilities of payment.

Special Fund for Military Service Credit – The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

Total Pension Liability – The portion of the Actuarial Present Value attributable to past service in accordance with the Entry Age cost method as stipulated by GASB Statement Number 67 (GASB 67).

Unfunded Actuarial Accrued Liability – The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

SECTION 9 - RESULTS BY DEPARTMENT

Department	Storm Water Enterprise	Housing	Municipal Light	School	Sewer	Water	Retirement	Town	Total
Summary of Member Data as of January 1, 2019									
Active Members	2	3	67	50	3	12	1	217	355
Average Age	55.8	55.9	48.7	51.0	44.6	44.6	47.5	45.5	47.0
Average Service	10.4	11.8	15.1	8.8	18.8	13.8	13.3	12.9	12.8
Salary	73,912	194,602	6,827,037	2,924,240	173,125	730,368	90,205	16,367,996	27,381,485
Average Salary	36,956	64,867	101,896	58,485	57,708	60,864	90,205	75,429	77,131
Retired Members and Survivors	0	6	71	91	3	9	0	144	324
Annual Pensions	0	130,999	3,184,860	1,283,313	49,899	346,647	0	5,268,204	10,263,921
Average Age	0.0	73.0	71.6	78.1	73.1	71.0	0.0	74.0	74.5
Disabled Members	0	0	7	0	1	2	0	29	39
Annual Pensions	0	0	301,591	0	29,508	53,563	0	1,036,879	1,421,542
Average Age	0.0	0.0	62.0	0.0	75.9	61.5	0.0	68.6	67.2
Inactive Members	0	0	4	10	1	2	0	26	43
Annuity Savings Fund	0	0	339,339	333,134	13,122	2,422	0	597,461	1,285,478
Normal Cost as of January 1, 2019									
1.1 Total Normal Cost	13,462	30,809	1,166,163	410,898	16,407	78,000	10,832	2,594,576	4,321,147
1.2 Administrative Expenses	623	1,426	53,975	19,018	759	3,610	501	120,088	200,000
1.3 Total Normal Cost = 1.1 + 1.2	14,085	32,235	1,220,138	429,916	17,166	81,610	11,333	2,714,664	4,521,147
1.4 Employee Normal Cost	6,999	18,919	689,556	285,191	16,614	70,844	9,323	1,619,143	2,716,589
1.5 Employer Normal Cost = 1.3 - 1.4	7,086	13,316	530,582	144,725	552	10,766	2,010	1,095,521	1,804,558
1.6 Adjusted for payment timing	7,480	14,056	560,064	152,767	583	11,364	2,122	1,156,394	1,904,830
Actuarial Accrued Liability as of January 1, 2019									
2.1 Active Employees	149,684	522,388	21,641,179	4,672,087	642,845	1,688,328	219,770	45,435,753	74,972,034
2.2 Retired Members and Survivors	0	1,352,035	32,062,992	10,965,709	576,284	3,452,734	0	49,784,318	98,194,072
2.3 Disabled Members	0	0	3,606,129	0	221,406	707,983	0	10,441,235	14,976,753
2.4 Inactive Members	0	0	339,339	333,134	13,122	2,422	0	597,461	1,285,478
2.5 Total = 2.1 + 2.2 + 2.3 + 2.4	149,684	1,874,423	57,649,639	15,970,930	1,453,657	5,851,467	219,770	106,258,767	189,428,337
Actuarial Value of Plan Assets as of January 1, 2019									
3.1 Actuarial Value of Assets	225,810	1,385,134	45,856,934	12,267,223	1,034,565	4,233,734	77,307	76,974,118	142,056,825
Unfunded Actuarial Accrued Liability (UAIL) as of January 1, 2019									
4.1 UAL = 2.5 - 3.1	(76,126)	489,289	11,790,705	3,703,707	419,092	1,617,733	142,463	29,284,649	47,371,512

Reading Contributory Retirement System
Actuarial Valuation as of January 1, 2019

SECTION 9 - RESULTS BY DEPARTMENT

Department	Storm Water Enterprise	Housing	Municipal Light	School	Sewer	Water	Retirement	Town	Total
Summary of Member Data as of January 1, 2019									
Projected Payroll	73,912	194,602	6,827,037	2,924,240	173,125	730,368	90,205	16,367,396	27,381,485
FY2020 Appropriation									
5.1 Employer Normal Cost	7,480	14,056	560,064	152,767	583	11,364	2,122	1,156,394	1,904,830
5.2 Amortization Payment of UAL *	(4,495)	33,198	1,221,281	480,829	44,856	211,925	(2,122)	2,392,640	4,378,112
5.3 Total = 5.1 + 5.2	2,985	47,254	1,781,345	633,596	45,439	223,289	0	3,549,034	6,282,942
FY2021 Appropriation									
6.1 Employer Normal Cost	7,779	14,618	582,467	158,878	606	11,819	2,207	1,202,649	1,981,023
6.2 Amortization Payment of UAL **	(9,839)	62,649	1,451,821	442,696	51,405	193,102	19,860	3,693,901	5,905,595
6.3 Total = 6.1 + 6.2	(2,060)	77,267	2,034,288	601,574	52,011	204,921	22,067	4,896,550	7,886,618
6.4 Adjusted Appropriation***	2,060	197	5,174	(29,482)	132	521	(22,067)	(239,972)	(283,437)
6.5 Total = 6.3 + 6.4	0	77,464	2,039,462	572,092	52,143	205,442	0	4,656,578	7,603,181
Increase over prior year	-100.000%	63.931%	14.490%	-9.707%	14.754%	-7.993%	0.000%	31.207%	21.013%
FY2022 Appropriation									
7.1 Employer Normal Cost	8,090	15,203	605,766	165,233	630	12,292	2,295	1,250,755	2,060,264
7.2 Amortization Payment of UAL	(10,364)	65,992	1,529,282	466,316	54,148	203,405	20,920	3,890,986	6,220,685
7.3 Total = 7.1 + 7.2	(2,274)	81,195	2,135,048	631,549	54,778	215,697	23,215	5,141,741	8,280,949
7.4 Adjusted Appropriation***	2,274	206	5,413	(22,638)	139	547	(23,215)	(184,303)	(221,577)
7.5 Total = 7.3 + 7.4	0	81,401	2,140,461	608,911	54,917	216,244	0	4,957,438	8,059,372
Increase over prior year	0.000%	5.082%	4.952%	6.436%	5.320%	5.258%	0.000%	6.461%	6.000%

Notes:

1. Actuarial Value of Plan Assets (3.1) is derived from allocation of assets as shown on separate attachment.
2. FY2021 and FY2022 Appropriation is based on Funding Schedule N-1A adopted by the Retirement Board May 7, 2020.
3. 2020 Employer Normal Cost (5.1) is the Employer Normal Cost as of January 1, 2019, adjusted for payment timing (1.6). 2021 Employer Normal Cost (6.1) is based on 2020 Employer Normal Cost (5.1) increased by 4%.
4. Amortization Payment of UAL (5.2) equals fiscal year 2020 budgeted appropriation (5.3) developed in the January 1, 2017 actuarial valuation less Employer Normal Cost (5.1).
5. Amortization Payment of UAL (6.2) is the total Amortization Payment of UAL (6.2) allocated to each department in the proportion that the UAL (4.1) less 2020 Amortization Payment of UAL (5.2) bears to the total UAL (4.1) less total 2020 Amortization Payment of UAL (5.2).
6. The appropriation developed for the Retirement department and any appropriation less than zero is allocated to each remaining department in the proportion that the department's fiscal year appropriation bears to the total fiscal year appropriation. Further, the appropriation for the General Fund (School and Town) is further reduced by \$283,437.

Reading Contributory Retirement System
Actuarial Valuation as of January 1, 2019